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(54) Dry cell batteries

(57) A dry cell battery comprises a layer of plastics material, on which a coating (5) of metallic material has been provided e.g. by a metal spraying operation, the sheet of plastics material being formed into a tube (4) to afford a cathodic container. The lower end of the tube is closed by a circular base cap (11), and the tube is filled with an electrolyte medium, the tube being closed at its upper end portion by a cap (3).

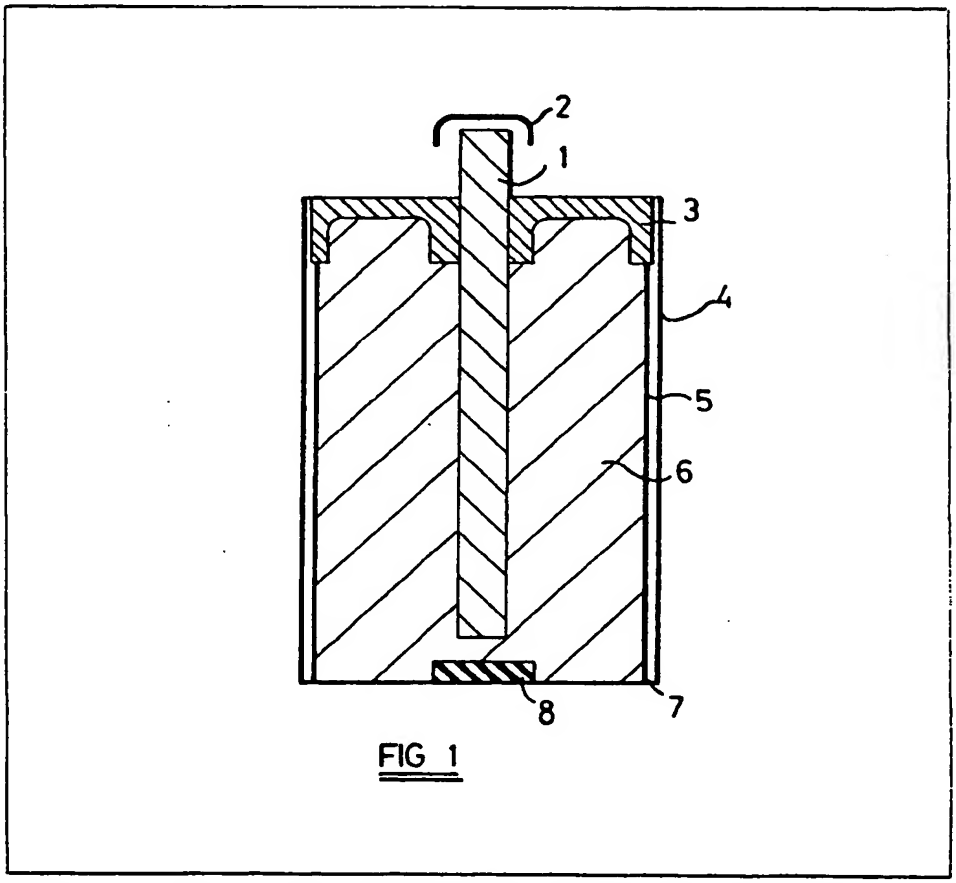

FIG 1

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The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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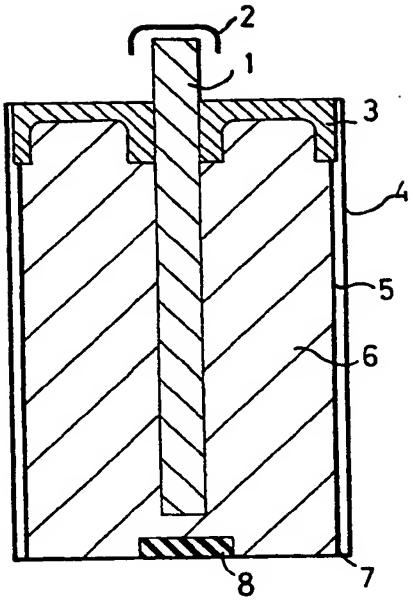

FIG 1

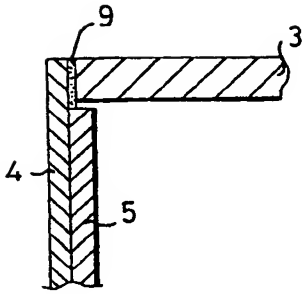

FIG 2

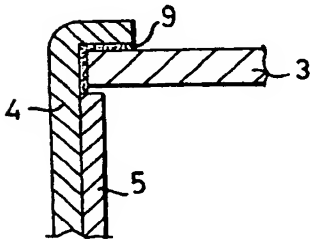

FIG 3

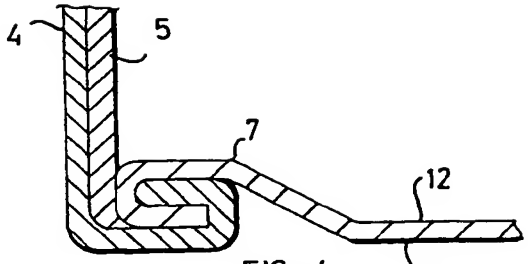

FIG 4

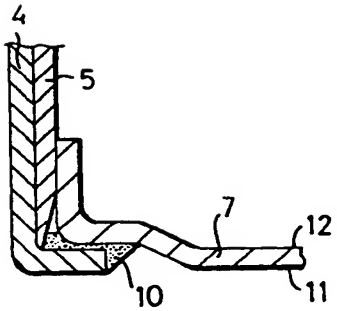

FIG 5

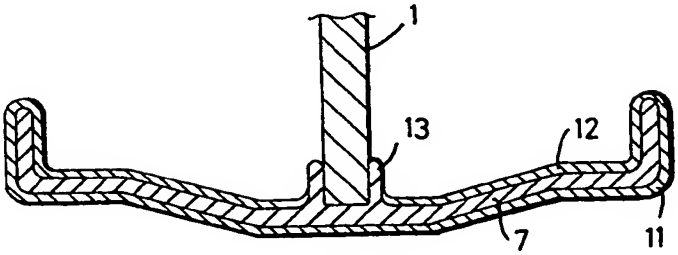

FIG 6

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SPECIFICATION

Improvements relating to dry cell batteries

This invention is concerned with improvements relating to dry cell batteries.

A conventional dry cell battery comprises a cathodic container provided by a zinc casing, stamped from a zinc pallet to provide a cylindrical side wall and integral base. The zinc casing is filled with reactive chamicals, retained within the casing by a sealed cap, through which the positive (anode) terminal extends.

Conventionally, the zinc casing is surrounded by a tubular cardboard sleeve, which carries at its base a metal disc, the metal disc affording the base plate of the battery and being the negative terminal. To ensure good electrical contact between the zinc casing and the base plate, the cardboard sleeve may be provided with an interior layer of aluminium foil, which is crimped into conductive contact with the base plate. At its upper end, the cardboard sleeve is crimped beneath an inturned lip of the zinc casing.

Extending around the cardboard sleeve is an outer jacket of mild steel. The jacket is maintained separated from the zinc casing by the cardboard sleeve and is not in electrical contact with the casing.

Manufacture of dry cell batteries in this way is time consuming and expensive. Additionally, when the battery is run down, the zinc casing is thin and may easily be damaged, allowing the chemical materials to leak from the battery. Thus further complicated expedients are required to provide "sealed unit" batteries.

According to this invention there is provided a dry cell battery in which the cathodic container comprises a layer of plastics material, on which a layer of metallic material has been deposited.

The layer of plastics material and metallic material may be formed as a sheet which may itself be formed into a tube, which may be closed at the bottom with a circular end piece sealed to the tube. The end piece may be such as will afford electrical connection with the interior layer of metallic material, in the provision of the negative terminal of the battery. Thus, the end piece may either establish the negative terminal itself, or may be placed in conductive contact with an end piece which itself provides a negative terminal.

If desired, the cathodic container in accordance with this invention may be utilised in conjunction with a conventional steel jacket and a conventional cardboard sleeve, but it is believed that this latter element is not necessary, the layer of plastics material affording the insulation between the layer of metallic material and the steel jacket, as would otherwise be provided by the cardboard sleeve.

The sealing connection between the tube of plastics material and the cap, and with the end piece, may be effected by adhesive, but preferably ultrasonic welding or heat sealing is utilised.

The layer of metallic material may be deposited on the sheet of plastics material in a number of ways, but most conveniently is afforded by a metallic spraying operation, for example of the kind utilising apparatus described in U.K. Patent Specification 1,540,810. In this manner, a relatively low temperature of deposition may be utilised.

The metal which is sprayed will be dependent upon the type of dry cell being constructed, for cells of the Lechlanche type, the metallic coating will be of zinc.

The coated sheet may be cut and rolled into tubular form of desired diameter from which appropriate lengths may be cut relatively simply by the use of automatic machinery.

By the use of this invention a less expensive construction of cathodic container is achieved, whilst providing a better utilisation of cathodic material, with improved resistance to leakage.

There will now be given a detailed description to be read with reference to the accompanying drawings, of a dry cell battery which has been manufactured in accordance with this invention, the method of manufacture and the dry cell battery both being illustrative of certain aspects of this invention.

The dry cell battery which is the preferred embodiment of this invention comprises a tubular case, afforded by a tubular sleeve 4 of plastics material, and an interior metal lining 5, applied to the plastics sleeve by a metal spraying operation, of the kind described in the Specification of our U.K. Patent No. 1,540,810.

Secured to the top of the case is a plastics former or cap 3, which is secured to the tubular sleeve 4 by means of a suitable adhesive 9, either in straight abutment with the tubular sleeve 4, as is shown in *Figure 2*, or in conjunction with a "crimped" turnover of the sleeve, as is shown in *Figure 3*.

Alternatively, the plastics former may be secured to the tubular plastics sleeve by ultrasonic welding or similar technique.

The battery comprises a base 7, which may be of plated or unplated steel, or conveniently by use of a plastics material provided on its interior and exterior surfaces with a metallic coating, in a manner similar utilised to provide the tubular casing. The base 7 thus comprises an exterior surface 11 of metal, and an interior surface 12, part at least of which is metallic.

The casing 4 may be secured to the base 7 by the use of a crimped joint (as shown in *Figure 4*) made in such a manner that the metallic coating 5 is brought into contact with the base 7, or the exterior coating of the base 7 if the base 7 is of coated plastics material.

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Alternatively, the base 7 may be suitably shaped to ensure with the metallic coating 5, and may be joined to the casing 4 by means of a roll-over joint (*Figure 5*) and a suitable adhesive.

In this manner, electrical connection between the metallic coating 5 and the exterior of the base 7 is afforded.

The casing is filled with electrolite medium 6, and a carbon electrode 1 is inserted through the cap 3, projecting into the casing, a metal cap 2 being secured to the upper end of the electrode to provide the positive terminal of the battery.

Where a steel or wholly metallised base is used, an insulator 8 may be provided on the interior of the base, to prevent electrical contact between the carbon electrode 1 and the base 7. However, where a plastics base is utilised, the metallic coating provided on its interior surface may be such as to leave a non-coated, and hence non-conductive, area directly beneath the carbon electrode. Indeed, the base, if of plastics, may be suitably moulded at its central portion, to provide a positive non-conductive location 13 for the base of the carbon electrode (*Figure 6*).

By the use of the invention described above, a casing for a dry cell battery may be provided, which may readily be secured to the cap and base in a manner such as to wholly resist leakage of electrolite medium therefrom, when the battery is spent. The coating 5 of zinc provided on the interior of the plastics sleeve 4 may be selected in accordance with the power supplying requirements of the battery, rather than the need to provide an enclosed container for the electrolite medium.

In this manner, a dry cell battery may be made more conveniently and less expensively than is at present possible and/or significantly reducing the tendency of electrolite medium to leak from the casing.

CLAIMS

1. A dry-cell battery in which the electrodic container comprises a layer of plastics material, on which a layer of metallic material has been deposited.

2. A dry-cell battery according to Claim 1 wherein the layer of plastics material is in the form of a tube, the metallic material forming a layer on the interior of the tube.

3. A dry-cell battery according to Claim 2 wherein the lower end portion of the tube is closed by a circular end piece, which affords electrical connection with the interior of metallic material.

4. A dry-cell battery according to Claim 3 wherein the end piece is sealingly connected to the tube at the lower end portion by adhesive, ultrasonic welding or heat sealing.

5. A dry-cell battery according to any one of Claims 2 to 4 wherein the upper end portion of the tube is closed by a cap.

6. A dry-cell battery according to any one of Claims 2 to 5 wherein the tube is filled with electrolyte medium, and a further electode extends into the electrolyte medium.

7. A dry-cell battery according to any one of Claims 2 to 6 comprising a casing within which the electrodic container is located.

8. A dry-cell battery according to any one of the preceding claims wherein the container is a cathodic container, and the metallic coating comprises zinc.

9. A method of manufacture of a dry-cell battery, in which a layer of metallic material is deposited on a sheet of plastics material, and said coated sheet is utilised to provide the electrodic container of the battery.

10. A method according to Claim 9 wherein the coated sheet is cut and formed into a tube to provide the electrodic container.

11. A method according to one of Claims 9 and 10 wherein the layer of metallic material is deposited on the sheet of plastics material by a metal spraying operation.

12. A dry-cell battery constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings

13. A method of manufacture of a dry-cell battery, when carried out substantially as hereinbefore described with reference to the accompanying drawings.

14. Any novel feature or novel combination of features hereinbefore described and/or shown in the accompanying drawings.

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